UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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JUN 2 1 2013

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Mr. Thomas Smith, Director
West Virginia Division
Federal Highways Administration
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Colonel Steven McGugan, District Engineer
Huntington District
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Re: Draft Supplemental Environmental Impact Statement
King Coal Highway Delbarton to Belo Project and Buffalo Mountain Surface Mine Clean Water Act Section 404 Permit Application

Dear Mr. Mattox, Mr. Smith and Colonel McGugan:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Supplemental Environmental Impact Statement (Draft SEIS) for the King Coal Highway Delbarton to Belo Project and Buffalo Mountain Surface Mine Clean Water Act Section 404 Permit Application (Project), and offers the following comments. Our review and comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) Regulations (40 C.F.R. Parts 1500-1508), Section 309 of the Clean Air Act and Section 404 of the Clean Water Act. The Draft SEIS was jointly prepared by the U.S Army Corps of Engineers, Huntington District (Corps) and the West Virginia Division of the Federal Highway Administration (FHWA) in cooperation with the West Virginia Department of Highways.

We appreciate your decision to conduct this supplemental analysis under NEPA. NEPA serves an important role in the decision-making process for federal actions significantly affecting the quality of the human environment. Through the NEPA process, federal agencies investigate and analyze the potential impacts of a proposed action and reasonable alternatives, as well as measures that could mitigate any potential harmful effects. NEPA brings transparency to the federal decision-making process, requiring that other federal, state, tribal and local agencies, as well as citizens, are given a meaningful opportunity to provide comments, helping to ensure federal decisions are better informed.

Our concerns focus on the nature and extent of direct, indirect, and cumulative adverse impacts to human health and the environment expected to result from the construction and operation of the proposed Project and the lack of information in the Draft SEIS assessing these effects. As currently proposed, the Project represents one of the largest surface coal mines ever proposed in Appalachia. It would create twelve valley fills, bury 7.4 miles of high quality streams, and have temporary impacts to an additional 3.3 miles of streams, as a result of construction of the mine and anticipated highway connections. Moreover, the Draft SEIS does not evaluate any project alternatives that may be available to avoid and minimize these impacts; alternatives that may provide the basis for a project that meets the identified goals and objectives in a cost effective and technically feasible manner and reduced environmental impacts. Our experience in Appalachia demonstrates that it is possible to improve mine design to better protect water quality and the environment, reduce costs, and maximize coal recovery.

This letter reflects our interest in providing you with constructive input on the proposed project. We hope you will find these comments helpful and we are happy to work with you as you identify a technically feasible and environmentally sustainable coal mine and highway.

Project Alternatives

The "heart" of an EIS is the consideration of a reasonable range of project alternatives, providing a clear basis for choice among options by the decision-maker and the public. In addition to these NEPA requirements, the Clean Water Act Section 404(b)(1) Guidelines (Guidelines) provide that only the least environmentally damaging practicable alternative be permitted. Despite these requirements, this Draft SEIS does not study a range of detailed alternatives; it evaluates only the Project as proposed, compared to the "no-action" alternative.

We are concerned that this limited analysis does not recognize that there are likely additional practicable alternatives that can meet the stated project purpose while more effectively avoiding and minimizing anticipated significant adverse environmental impacts. Reasonable alternative configurations should be evaluated in the Draft SEIS to determine if the project purpose can be achieved with less environmental impact. EPA recognizes the value of economic development in the area and understands that a variance from the Approximate Original Contour requirements was approved. We are interested in working with you to explore practical alternatives to reduce stream impacts by, for example, returning more spoil back on the mined area. We expect that a broader look at feasible alternatives may find that such development is

possible while reducing anticipated impacts to the environment and human health. Evaluation of additional alternatives under both NEPA and the Clean Water Act is essential for supporting a fully informed and analyzed decision regarding this complex project.

We have consistently recommended that this NEPA analysis include an evaluation of alternatives beyond those proposed by the permit applicant. To provide additional technical assistance on this issue, EPA retained Atkins Global (subcontracting with mining engineers at Morgan Worldwide) to assist in exploring whether there might be alternative approaches to the Project which could further avoid and minimize environmental impacts while meeting the Project purposes. Its evaluation, which was shared with you in preliminary form in December 2012, suggests that there are likely cost effective and technically feasible alternatives that would lessen the potential environmental impacts of the proposed Project. While we understand that you expressed concerns with the preliminary information developed by Morgan Worldwide, we believe this analysis can serve as a useful point of reference as you assess alternatives to the applicant's proposed mine plan.

We recommend that the lead agencies undertake an analysis of a range of alternatives and evaluate the environmental consequences to ensure that the least environmentally damaging practicable alternative (LEDPA) has been selected, as required by the Guidelines. Without this additional analysis, we do not believe there is sufficient information to make the determination that the preferred alternative represents the LEDPA.

Impacts to Aquatic Resources

We are concerned over potential impacts to the very good quality aquatic ecosystems from the proposed Project, as well as the analysis of these potential impacts in the Draft SEIS. The proposed Project would bury very good quality, functioning headwater streams, which are vital components of the ecosystem. Headwater streams collectively provide high levels of water quality and quantity, natural flood control, sediment control, nutrients, and organic matter. As a result, headwater streams are largely responsible for maintaining the quality of the downstream rivers and streams, which is particularly important where those steams are already impaired. These streams also support biodiversity by providing habitat for macroinvertebrates and amphibians, and are the primary connection between the larger watershed network and the surrounding landscape, allowing for the exchange of material to downstream waters and up the food chain. Impacts to these important environmental resources will adversely affect the benefits the public obtains from these ecosystems and limit their contribution to overall watershed health.

We are concerned that the analysis of potential significant impacts to aquatic resources, including impacts resulting from the physical loss of streams buried by mining waste and the chemical and biological effects to water bodies downstream of valley fills, is almost completely absent from the Draft SEIS. NEPA and the Guidelines require analysis of all direct, indirect, and cumulative adverse impacts to aquatic resources resulting from proposed fill material discharges. The Guidelines prohibit discharges that will result in significant degradation (40 CFR 230.(c)) of the waters of the U.S. The analysis of impacts is necessary to support the Corps' determination

regarding the potential for significant degradation. In this case, due to the high quality of the streams on-site, we believe there is the potential for degradation of the functions of waters even if the waters minimally support water quality standards. It is important to emphasize that a significant degradation analysis is separate from the evaluation required to assess the potential to cause or contribute to a violation of water quality standards. Degradation of high quality headwater streams resulting from valley fills and downstream water quality effects are the kind of significant impacts that the analysis for NEPA and Section 404 Guidelines is intended to address. The Draft SEIS does not evaluate that significant impact, especially when coupled with other damage to streams that would impair their function. We recommend that the analysis include a more robust consideration of potential impact to surface water quality and biological conditions, and a discussion of what efforts will be undertaken to ensure that the streams' physical, chemical, and biological integrity are maintained.

We also have concerns that the Draft SEIS over estimates the effectiveness of the proposed mitigation to compensate the environmental impacts that are expected. Our concerns regarding mitigation focus on two deficiencies in the information contained in the Draft SEIS; 1) that data being used to characterize the nature and extent of project impacts are not sufficient and therefore may under estimate the effects that will occur and the mitigation necessary to ensure adequate compensation, and 2) that the mitigation being proposed will not be effective in replacing the ecological functions and values of the headwater streams being buried by mining activities. A growing body of scientific literature has demonstrated very limited success in replacing the important functions and values of headwater streams. EPA recommends that an evaluation be made using more representative and accurate data regarding the impacts from the joint development project to aquatic resources and forestland conversion. There are significant concerns that these impacts cannot be effectively mitigated. Therefore, it is essential that avoidance and minimization of impacts to these resources be sought to the maximum practicable extent under the CWA Guidelines.

Air Quality

NEPA requires analysis of reasonably foreseeable direct and indirect impacts. The Draft SEIS now includes only general statements about air emissions and impacts on the surrounding communities, and does not provide support for the conclusion that air impacts are primarily dust related and restricted to the immediate vicinity of the mining operation.

Considering the types of activities that occur at a surface mine along with the large amount of diesel fuel that would be consumed by the equipment and trucks at the proposed mine, additional air impacts are likely in and around the immediate vicinity of the mine during the anticipated 15-year life of the Project. We therefore recommend a more comprehensive assessment of potential air quality impacts and reasonable measures for addressing them. For example, a number of approaches to reducing diesel engine emissions are readily available, including replacing older, higher polluting equipment with engines meeting the most recent emission standards, retrofitting existing equipment in stages (*i.e.,* retrofitting some equipment

while other equipment operates) over the life of the project and limiting idling from diesel engines when not in use.

Cumulative Impacts

NEPA and the CWA Guidelines require an analysis of the cumulative effects of a proposed action considered together with other past, present and reasonably foreseeable actions. We are concerned that the approach used in the Draft SEIS for the cumulative effects analysis is limited, and is primarily an accounting of activities within the watershed, i.e., total number of streams filled or acres of forest cleared. While this accounting may be useful, the Draft SEIS does not present an effective analysis of how those activities may have or will affect environmental resources and functions. Instead, the Draft SEIS provides a table of the anticipated effects on different resources, using three broad rankings ("positive," "negative" and "mixed") to indicate the expected effects, with no information to support the rankings.

The Draft SEIS also relies on the Corps' recently developed Cumulative Effects Analysis tool to evaluate impacts to water quality. As we have recognized in the past; we are particularly concerned that the tool uses a statistical analysis to presume a cause and effect relationship between water quality and specific watershed characteristics such as "total mining percentage", "valley fill percentage", and "road crossings per stream mile" and then concludes whether an undefined watershed condition index would increase or decrease under the no-build and Project alternatives. Unfortunately, the specifics of the methodology used to develop the tool were not provided in the Draft SEIS. We are not confident that this method of reporting a potential change in a watershed condition index helps decision makers or the public better understand or predict the potential cumulative effects associated with a proposed project.

We are also concerned that the cumulative effects analysis does not account for the current scientific literature reporting adverse cumulative effects from surface coal mining activities in Appalachia, including adverse impacts to water quality. As a cooperating agency, we look forward to working with you to assist in the development of a more meaningful cumulative effects analysis.

Conclusion

The preferred alternative evaluated in the Draft SEIS would have significant direct, indirect, and cumulative adverse environmental impacts, impacts that may be avoided and minimized by cost effective and technically feasible changes to the applicant's mine plan that have not been meaningfully evaluated. EPA's review identified significant inadequacies in the analysis and information provided in the Draft SEIS. We are confident that more thorough and comprehensive analysis would identify reasonable opportunities to achieve the stated Project purposes with fewer environmental impacts.

We have included detailed comments that address a wide range of issues, including impacts to Environmental Justice communities, cultural resources, potential health impacts, drinking water, and hydrology, and appendices that we hope will assist you in your continued efforts to address the important procedural and environmental issues surrounding this Project. In addition, we have cited both published and unpublished studies, data, and information that we believe will prove useful. We are ready to work with our federal and state partners and the mine operator to conduct this analysis in a timely manner.

Based on the magnitude of the environmental impacts described in the Draft SEIS and the significant inadequacies in the information provided in the document, we have rated this Draft SEIS as "EU-3" (Environmentally Unsatisfactory – Inadequate Information). We believe our concerns about the analysis can be resolved in a timely way and look forward to working with you to develop a more robust examination of a reasonable range of alternatives.

If you have any questions, please do not hesitate to contact me or have your staff contact Mr. John R. Pomponio, Director, Environmental Assessment and Innovation Division, at 215-814-2702.

Sincerely,

Shawn M. Garvin
Regional Administrator

cc: Mr. Greg Bailey, P.E, WVDOH

Enclosures

Enclosure 1
EPA's Detailed Comments for the King Coal Highway Delbarton to Belo Project and Buffalo Mountain Surface Mine Clean Water Act Section 404 Permit Application Draft Supplemental Environmental Impact Statement

Project Background

The King Coal Highway (KCH) is envisioned has a 94-mile transportation corridor within West Virginia and is part of the I-73/74 Corridor which spans from Michigan to South Carolina. A Draft and Final Environmental Impact Statement was prepared by Federal Highway West Virginia Division and West Virginia Department of Highways in 2000 (KCH EIS, 2000). EPA reviewed and commented on the entire proposed King Coal Highway project in 2000. The KCH Final EIS identified as the preferred alternative a 94-mile-long, 1,000-foot-wide corridor running from near Bluefield in Mercer County to near Williamson in Mingo County. The KCH Final EIS did not include the joint development project and the proposed Delbarton to Belo segment described in the Draft SEIS. This segment represents a shift from the alignment studied in the KCH Final EIS.

The joint development project described in the Draft SEIS was first brought to EPA's attention in November 2008 in connection with our review of a public notice by the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act in connection with the construction, operation and reclamation of the Buffalo Mountain Surface Mine (BMSM). The public notice identified leaving rough grade for a portion of the KCH as a proposed post-mining land use. EPA provided comment on the public notice on January 20, 2009. Among other things, EPA recommended development of an Environmental Impact Statement in light of the magnitude of the project, the dual nature of the project purpose, and the nature of the anticipated impacts. EPA also provided comment on the range of alternatives being considered, the magnitude and nature of the proposed impacts including water quality, the conceptual mitigation plan, and the need for a cumulative impact analysis.

FHWA, DOH, the Corps and EPA have coordinated on the combined study since 2011. EPA received a Preliminary Draft Environmental Assessment for the Delbarton to Belo section and following interagency discussions the lead agencies announced that an EIS would be prepared on December 12, 2011. EPA agreed to participate as a cooperating agency in the development of the SEIS in correspondence dated March 16, 2012 and sent scoping comments for the SEIS in a letter dated March 19, 2012. EPA has continued informal communications with the lead agencies.

From October 2011 through October 2012, EPA reviewed a draft National Pollutant Discharge Elimination System (NPDES) permit for proposed discharges of effluent from the BMSM submitted by the West Virginia Department of Environmental Protection (WVDEP) pursuant to Section 402 of the Clean Water Act (CWA), 40 C.F.R. §§ 123.43 and 123.44 and the *Memorandum of Agreement Regarding the Administration and Enforcement of the NPDES Program in West Virginia (1982)*. On January 20, 2012, EPA provided WVDEP with a specific objection to the draft NPDES permit because it failed to contain the minimum effluent limits and

other conditions sufficient to achieve applicable water quality standards. EPA provided additional comments including concern that the project would result in substantial degradation of its receiving waters from very high quality to marginally supporting water quality standards and that the alternatives analysis included in the anti-degradation justification was extremely limited.

EPA's decision to withdraw its objection to the draft NPDES permit for the project should not be construed as a determination that the project satisfies the CWA Section 404(b)(1) Guidelines (Guidelines). The Guidelines prohibit discharges that will result in significant degradation (40 CFR 230.(c)) of the waters of the U.S. The analysis of impacts is necessary to support the Corps determination regarding the potential for significant degradation. A significant degradation analysis is separate from the evaluation required to assess the potential to cause or contribute to a violation of water quality standards (40 CFR 230.10(b)), a provision of the Guidelines more closely associated with water quality conclusions reached under CWA Sections 401 and 402. Due to the high quality nature of the streams on-site, we believe there is the potential for degradation of the functions of waters even if the waters minimally support water quality standards. While the lead agencies can and should consider West Virginia's CWA Section 401 water quality certification and the provisions of the NPDES permit, water quality considerations as part of the NEPA process should not be limited to deference to those actions.

Purpose and Need

The Draft SEIS states the project purpose and need as developing a mine that accommodates the future construction of the King Coal Highway between Delbarton and Belo. Although not discussed as part of the project purpose and need in Section 2.3, the preferred alternative would leave a portion of the Approximate Original Contour (AOC) variance area that is not used for the highway and associated utility corridor as land available for future economic development (approximately 784 acres). If the lead agencies determine to treat creation of developable land as part of the project purpose and need, then the Draft SEIS should fully develop this aspect of the project's purpose and need. For example, EPA recommends the lead agencies explain need and explore technically feasible options for using additional lands in the mining area for placement of spoil to reduce impacts to the waters of the U.S..

Alternatives

As stated in the cover letter, EPA believes that the EIS should analyze alternatives beyond the applicant's proposed mining plan in order to assess cost effective and technically feasible options for reducing anticipated adverse environmental impacts. Experience with Appalachian surface coal mining has recently identified improvements in mining methods and mine design not included in the alternative evaluated in the Draft SEIS that would be effective in avoiding and mininimizing Project impacts by, for example, reducing the size and number of valley fills. We believe the mining analysis conducted in the Atkins Report (developed by Morgan Worldwide) represents an effective point of reference that would be very useful to you in assessing revisions to the applicant's mine plan. The Draft SEIS does not carry forward for analysis options presented in the Atkins Report for substantially reducing the number of valley fills and limiting stream impacts by over 50 percent. Consideration of only one mine plan in the Draft SEIS, the applicant's proposed plan, is not consistent with the provisions of NEPA and the

CWA Guidelines requiring consideration of a reasonable range of alternatives that avoid and minimize project impacts. We look forward to working with you and the mine operator to evaluate changes in the mine plan consistent with these provisions of the law and to incorporate this analysis into the Draft SEIS.

The alternatives section should also include a discussion of alternative best management practices and other actions that are feasible and practicable, e.g., the recirculation system. As part of adaptive management, the applicant identified potential future measures that may be considered. These include: increasing stream buffer zones; if necessary, conducting Toxicity Reduction Evaluation (TRE)/Toxicity Reduction Identification (TRI) pursuant to EPA's Technical Support Document; segregating weathered rock and returning to surface; limiting the number of active fills; and canting the faces of the fills to one side. We recommend a discussion of these alternative measures as part of the alternatives analysis. In addition, a reasonable range of alternatives might consider alternate configurations of fill and highway design exploring options such as bridging or alignment shifts to determine if resource avoidance and minimization is possible.

We also recommend that Table 4-31 be revised: this Table is intended to compare the impacts and costs of the highway and mine projects, if constructed separately, with the proposed joint development project. For example, we do not believe it is appropriate to assume that impacts from the "separate" KCH would be the same as the impacts from construction within the original alignment, which consists of a 1,000 foot corridor, and not the ultimate 300 foot right-of-way. With regards to the mine project, by assuming the configuration in the Surface Mining Control and Reclamation Act (SMCRA) application, the "mine only" impacts do not account for the fact that the mine and fill placement was designed to accommodate the highway (see, e.g., Section 3.3.2.5).

Baseline Data Concerns

The Draft SEIS relies on biological, water quality, habitat, and fish data collected from 2006 – 2011. EPA has reviewed these data, as well as data submitted as part of the Environmental Information Document, Conceptual Mitigation Plan, and Aquatic Ecosystem Protection Plan. EPA has concerns about the representativeness of the data as a result of deficiencies including the low numbers of benthic macroinvertebrates in subsamples, inaccurate taxonomic identifications, uncertain water quality values, unusually low and disputable Rapid Bioassessment Protocols (RBP) scores, and fish sampling efficiency problems and inaccurate species identifications. In May of 2012, EPA scientists accompanied WVDEP and the applicant's consultant to each of the proposed NPDES outfalls to collect data. Our findings are summarized in Pond et al. 2013. We found low conductivity (43 – 152 uS/cm), West Virginia Stream Condition Index (WVSCI) and Genus Level Index of Most Probable Stream Status (GLIMPSS) scores that were highly comparable to reference condition (85.4 – 93, and 73.5 – 85.0, respectively), and sub-optimal to optimal RBP scores (127 – 160) at each site. EPA considers this dataset to be more representative of the true condition of these resources and recommends its incorporation into all documents submitted by the applicant.

Benthic macroinvertebrate data

We are concerned with the benthic macroinvertebrate data included in the Draft SEIS, specifically the paucity of individuals collected; 84% of the samples in the fall and 57% of samples in the spring had fewer than 100 individuals. Some samples had less than 50 individuals. In contrast, <5% of all WVDEP samples (n=5,449) have less than 100 organisms, and most of these are due to severe sedimentation or acid mine drainage. The majority of the samples used in the Draft SEIS contain such few organisms as to appear reflective of measurement or other errors such as sampling too soon after a large precipitation event, and are not representative of true biological condition of these streams as observed and sampled by EPA scientists in the field.

Further evidence exists that demonstrates that the submitted biological data are likely not representative and have abundance estimates off by an order of magnitude. In May 2007 and 2008 Merriam et al. (2011) collected benthic macroinvertebrates following modified WVDEP protocols in 29 small streams (197 – 2,471 acres) in the Pigeon Creek watershed, including five sampling locations near the project site (Conley Branch, lower Hell Creek, UNT of Right Fork Hell Creek, Left Fork Hell Creek, and Pigeonroost). They collected an average of 1,996 individuals per square meter in each mined stream, 3,595 per square meter in streams with residential development, and 1,346 per square meter in streams with both mining and development. They collected an average of 1,063 per square meter in very small (0.8 – 1.0 km^2) reference streams. These concerns were discussed in a meeting with CONSOL and WVDEP representatives in July 2012.

WVSCI scores calculated with fewer than 100 organisms will tend to score lower on richness measures, portray instability in abundance measures, and be artificially low. In particular, richness metrics increase with the number of individuals collected; therefore use of samples with fewer individuals provides a less accurate representation of the biological condition of the resource. Early WVDEP samples were subsampled to 100 organisms, but WVDEP has been using a 200 individual fixed count since 1998 (Gerritsen 2000). The best standard values for WVSCI are based on 100 - 200 count subsamples (but overwhelmingly are driven by 200 count samples); therefore WVSCI should not be calculated on samples with less than 100 organisms.

Importantly, both the fall and spring 2006 sampling events were conducted outside of the WVSCI index period. The fall sample was collected in mid-December. Data collected during late fall/early winter can be problematic due to several factors. First, very few (<1%) of WVDEP samples (i.e., samples used to develop and calibrate the WVSCI model) were collected from mid-October through December. Thus data collected in this season are not comparable to the WVSCI reference condition (and could be considered outliers in a statistical sense) and thus WVSCI scores for these samples should not be compared to the WVSCI reference threshold. Second, many important indicator taxa (several EPT taxa) are generally not present in headwater streams during this time due to natural life history constraints. Collecting benthos at this time results in omission of key community-level information needed to assess the baseline conditions.

The Compensatory Mitigation Plan (CMP) and Aquatic Ecosystem Protection Plan (AEPP) included data collected from the impact sites in 2010 and 2011, but these data were not included in the Draft SEIS. The 2010 data suffered similar problems with lack of individuals and had several instances of inaccurate taxonomic identifications. The spring 2011 data that were collected for the 402 permit were adequate, but the sample locations will not be suitable for calculating debits and credits for mitigation because those sites occur downstream of the valley fills, not in the impact areas. However, these data could potentially be used for baseline conditions at sediment pond locations because of proximity, but this would require additional review.

EPA strongly recommends the data from May of 2012 be included to more properly document the quality of the resource.

Habitat data

The habitat data included in the Draft SEIS were collected in 2007. Information from the CMP indicates that habitat data may have been collected in November. The data provided in the Draft SEIS appear to be from different locations on each stream than the data provided in the CMP. The 82 CMP sites appear to be in impact (footprint) locations (pages 741-749 of the CMP), whereas the 44 sites in the Draft SEIS appear to be located farther downstream on each tributary. It is difficult to compare exactly how the sites overlap, because the coordinates provided in the Draft SEIS do not appear to be correct (specifically the longitude minutes and seconds) and we recommend rectifying this error. Habitat data were also collected in 2011, but these data are not reported in the Draft SEIS.

Based on our sampling in May 2012, the habitat scores in the Draft SEIS are too low and not representative of the condition of the streams. This has implications in the sufficiency of the data for the calculation of debits/credits for mitigation. For example, 4 of the 8 sites on Conley Branch reported in the documentation had RBP scores lower than 100, and 4 out of 7 sites in Right Fork Hell Creek had scores less than 100. The Palmer Drought Severity Index indicates that this part of WV was in a moderate drought in November 2007, so it is possible that some of the smaller streams were dry during this time period. If water dependent metrics were scored as zero in these streams, the resulting score reported by the applicant would be lower than expected. There are no individual metrics or photos to help us determine whether the reported scores accurately represent the physical condition of the stream.

EPA's findings from the May 2012 sampling event showed that RBP scores, which were collected at 11 monitoring stations located near the proposed NPDES outlets, ranged from 127 – 160. Again, EPA strongly recommended the data from the May 2012 sampling event be included in the Draft SEIS to properly document the quality of the resource.

Water chemistry data

EPA is concerned that the specific conductance values reported in the Draft SEIS do not appear accurate. Most are reported to be less than 5 uS/cm. These values are likely to be off by one decimal point (specific conductance in Ruth Trace Branch is likely 41 uS/cm instead of 4.1

and Pigeon Creek is likely to be 595 uS/cm instead of 59.5). We also found that pH values reported in the 2010 CMP appear incorrect. Several sites had pH values of ~4.0 while others had values >10.0 pH. These discrepancies may likely be a result of faulty meter calibration. The use of these values adversely affect mitigation debits/credits under West Virginia's Stream Wetland Valuation Metric calculations.

Other data sources show that specific conductance is very low in most of the tributaries and significantly higher in the mainstem of Pigeon Creek. EPA measured specific conductance during the May 2012 sampling event and specific conductance ranged from 32 – 152 uS/cm at the 11 monitoring stations located near the proposed NPDES outlets.

Fish Data

CONSOL hired Michael J. Baker, Inc. (Baker) to sample fish in 2006, 2008, and 2011 (CONSOL, 2012). Only the 2008 data were referenced in the Draft SEIS, with the conclusion that the fish population of Pigeon Creek consists mainly of pollution-tolerant species such as blacknose dace and creek chubs. The 2006 and 2008 data were used in the Environmental Information Document, and the 2006 and 2011 data were reported in the AEPP for the NPDES permit. We reviewed data from each sampling event, and identified three major deficiencies. These include the length of the reach sampled resulting in under-sampling, errors in identification of species, and sampling methods (electrofishing) that may have been inappropriate for the water conditions (high conductivity). Flawed baseline data may result in questionable characterization of resources, evaluation of current conditions, and interpretation and assessment of future monitoring data.

Data Gaps

Streams within the Central Appalachian ecoregion have some of the greatest aquatic animal diversity of any area in North America, including one of the richest concentrations of salamander fauna in the world. Salamanders are a diverse and unique form of Appalachian wildlife that depend on forested headwater habitat and decline or disappear from surface mined areas. There are no data on salamander populations found in the streams that will be impacted. During the spring 2012 sampling event, EPA biologists identified six salamander species downstream of the potential valley fill sites: *Desmognathus fuscus, Desmognathus monticola, Gyrinophilus porphyriticus, Eurycea bislineata, Notophthalmus viridescens*, and *Plethodon glutinosis* (a terrestrial species observed streamside). The Draft SEIS only mentions that three of these species have the potential to be present in the study area, and that habitat for these salamanders would be lost when valley fills are constructed. Recent studies have concluded that valley fills negatively impact stream salamander abundance due to alterations in habitat structure, water quality, and macroinvertebrate communities downstream of valley fills (Wood and Williams 2013). In un-impacted headwater streams, salamander densities can reach 6-7/m^2 (Wood and Williams 2013). We recommend accounting for the loss of this keystone group of vertebrates, both in the impact area and downstream, in the EIS and the CMP.

Resource Characterization and Anticipated Impacts

As stated above, EPA scientists accompanied WVDEP and the applicant's consultant to

each of the proposed outfalls from the proposed fill locations in spring 2012. The data collected by EPA reflected low conductivity (43 – 152 uS/cm); biological scores (utilizing both the WVSCI and the GLIMPSS) that were highly comparable to reference condition (85.4 – 93, and 73.5 –85.0, respectively), and sub-optimal to optimal RBP scores (127 – 160) at each site. EPA believes its data are representative of site conditions. Based on the data collected by EPA, the streams proposed to be specified disposal sites represent very good quality waters comparable to reference conditions.

The individual and cumulative importance of headwater streams can be substantial (e.g., Meyer et al., 2007). The burial and loss of natural headwater streams can have significant effects on stream ecosystem structure and function including the loss of efficiencies associated with the removal and transformation of nutrients and contaminants, organic matter storage and transport, and alteration of habitat for native biological communities (U.S. EPA 2011a). Nutrients are taken up and transformed more rapidly in headwaters, where waters slowed by woody debris and large inorganic substrates have longer contact times with biologically and chemically reactive benthic substrates and hyporheic zones. In addition to reducing excess nutrients, natural headwaters can remove metal contaminants (Schorer and Symader, 1998). In contrast, outflows from filled headwaters typically are net exporters of toxicants to downstream segments. The loss of natural ecosystem functions and the export of toxicants act in combination to increase risks to water quality and biological communities below mountaintop mining/valley fills (e.g., U.S. EPA 2011a).

We note that there are inconsistencies within the Draft SEIS and within Appendix D regarding expected impacts to surface waters. For example, page 331 in Appendix D indicates there would be 39,285 lf of permanent stream impacts, 10,215 lf of temporary stream impacts, and 0.02 ac of wetland impacts. However, page 336 in Appendix D indicates 41,651 lf of permanent stream impacts and 10,215 lf of temporary stream impacts. The table on page 4-165 of the Draft SEIS indicates 47,385 lf of permanent stream impacts, 9,215 lf of temporary stream impacts, and 0.19 ac of wetland impacts. Pages 4-47 and 4-87 of the Draft SEIS also indicate 47,385 lf of permanent stream impacts and 9,215 lf of temporary impacts. We note that table 4-22 on page 4-100 of the Draft SEIS, which indicates 39,285 lf of permanent stream impacts and 9,215 lf of temporary impacts, appears to be what was used for compensatory mitigation calculations. However, these figures need to be reconciled or clearly indicated what they represent with the various different (generally higher) impacts numbers depicted in several other locations throughout the Draft SEIS. Generally, however, it is anticipated that the mine will impact nearly 7.4 miles of stream to be directly lost through placement of fill for the mine and nearly 1.7 additional stream miles to be temporarily impacted as a result of the sediment ponds.

Aquatic

Through an extensive review of scientific literature and analysis, U.S. EPA (2011a) concluded that the effects of mountaintop mining/valley fills on streams in the Central Appalachian coalfields result in five central adverse alterations including: (1) springs, and ephemeral, intermittent, and small perennial streams are permanently lost with the removal of the mountain and from burial under fill; (2) concentrations of major chemical ions are persistently elevated downstream; (3) degraded water quality reaches levels that are acutely lethal to standard

laboratory test organisms; (4) selenium concentrations are elevated, reaching concentrations that have caused toxic effects in fish and birds, and; (5) macroinvertebrate and fish communities are consistently degraded.

Approximately 85% of the project area lies in the Pigeon Creek watershed, which is a tributary to the Tug Fork River of the Big Sandy River, while the remaining area falls within the Miller Creek watershed, which drains directly into the Tug Fork River. Pigeon Creek is already highly impacted by mining and residential impacts (Merriam et al. 2011), and was listed on WVDEP's 2010 303d list for biological impairment, and pH and iron criteria exceedences.

The streams proposed to be specified as disposal areas for placement of fill material are of very good quality comparable to reference conditions, and there is potential for the functions of these streams to degrade, even if the remaining downstream waters minimally support water quality standards. The Section 404(b)(1) Guidelines direct consideration of significant degradation of aquatic resources, which includes direct habitat loss associated with the burial of over 7 miles of streams and habitat degradation downstream of valley fills anticipated to result from diminution of water quality and the loss of upstream functions. Assessment of the potential for "significant degradation" under the Guidelines is separate from consideration as to whether the project is likely to cause or contribute to violations of State water quality standards. (*Compare* 40 C.F.R. § 230.10(b)(1) *with* 40 C.F.R. § 230.10(c). In many instances, the Section 401 certification and the NPDES permit may result in a departure from baseline conditions).

For this reason, the lead agencies should not rely solely upon the certification of a State or other federal agency regarding water quality standards. This is, in part, because certification does not mean that [the State] found no environmental damage, but rather that the damage would not be sufficient to violate water quality standards. While Appendix D states "As has been demonstrated in this document and in the referenced sections of the DEIS, the proposed project would not significantly adversely affect the discharge of pollutants on human health or welfare; life stages of aquatic life or other wildlife dependant on aquatic ecosystems; aquatic ecosystem diversity, productivity, and stability; or on recreational, aesthetic, or economic values," there are no specific analysis, evaluation, or methodologies cited in this determination. We recommend that the EIS include analyses addressing the potential for degradation of the very good quality waters proposed to be impacted.

Adverse impacts to these tributaries include the direct burial of high quality stream habitat, impacting all wildlife that utilize these streams for all or part of their life cycles (e.g., macroinvertebrate, amphibian, fish, and water-dependent bird populations). These streams and their adjacent riparian corridors provide important habitat for many taxa of macroinvertebrates as well as many species of amphibians, reptiles, crayfish, fish, birds, bats, and other mammals. These tributaries are high quality streams which provide important functions for the impaired Pigeon Creek watershed. These streams not only support resident wildlife, but also provide ecosystem functions for downstream waters, serve as refugia for aquatic life and potential sources for recolonizing nearby waters, and ultimately serve to maintain the aquatic ecosystem integrity in the sub-basin and the rich animal diversity in the ecoregion. Loss or burial of headwater streams and associated riparian and subterranean ecosystems can result in fragmentation of remaining habitats by increasing geographical distance among populations.

Subdivided populations are smaller in size, and thus more susceptible to loss of genetic diversity and to adverse effects of environmental change, placing them at higher risk of extinction (U.S. EPA 2011a).

As with the loss of biota, most ecosystem functions performed by a high-gradient, forested Appalachian headwater stream are lost when it is buried or removed. Some functions, such as water conveyance and export of dissolved solids, might continue under fills in a quantitatively or qualitatively altered state. Thus, burial of these tributaries could also result in adverse effects on downstream aquatic biota through the transformation of the buried areas from sources of clean water into net exporters of contaminants to downstream waters. Based on peer-reviewed literature, as well as available data from the adjacent Peg Fork Surface Mine, EPA has concluded that construction of the BMSM may transform these headwater streams from high quality habitat into net exporters of pollutants (particularly total dissolved solids and selenium) that will travel downstream and adversely impact the wildlife communities that utilize these waters.

Scientific literature has documented structural and functional ecosystem-level effects of elevated levels of total dissolved solids (Pond et al. 2008, Simmons et al. 2008, Palmer et al. 2010, Fritz et al. 2010) and selenium (Chapman et al. 2009, Diehl et al. 2005, Ferreri et al. 2004, Lemly 2009, Palmer et al. 2010, Neuzil et al. 2005, Vesper et al. 2008) discharged through mining operations on downstream aquatic ecosystems. Based on data provided by CONSOL as required in the Peg Fork Surface Mine Permit, EPA is concerned that conductivity and selenium are elevated and are continuing to rise downstream of CONSOL's adjacent Peg Fork Surface Mine valley fills. Conductivity downstream of some of the Peg Fork valley fills has increased by more than 500 uS/cm. The valley fills proposed for the BMSM will contain significantly more waste rock than the Peg Fork valley fills, and it is therefore possible that the BMSM valley fills will result in inputs of even more contamination than Peg Fork valley fills.

Increased pollutant levels may lead to loss of macroinvertebrate assemblages and population shifts to more pollution-tolerant taxa, specifically the extirpation of ecologically important macroinvertebrates. Based on extirpation concentrations derived for macroinvertebrates (U.S. EPA 2011b), EPA estimates that at least fourteen genera found in our baseline samples are predicted to be extirpated if specific conductance increases to 500 uS/cm in these tributaries. On a project-wide basis, this could account for 17% taxa loss (14 of 82 genera). EPA's Science Advisory Board stated that loss (extirpation) of a single genus is a significant ecological event. Reliance on WVDEP's CWA Section 401 Certification and the NPDES permit do not account for this effect. As reflected in the NPDES permit, WVDEP currently interprets West Virginia's narrative water quality criteria at the family level, and therefore does not account for taxa loss at the genus level. This is an example where significant degradation of the aquatic resource is not accounted for solely through minimal compliance with water quality standards. Through the loss of natural stream macroinvertebrate assemblages, there will be, in turn, effects further up the food chain. Even within functional feeder classifications, different genera feed, process, digest, and excrete organic matter and algae differently and thus have different effects on overall stream functions. Among other things, there may be an effect on migratory birds that use the area for breeding. For example, the breeding success of the Louisiana waterthrush is dependent on the diverse and productive assemblage of aquatic insects

supported by healthy headwater systems (Mattson et al. 2009).

In addition, Appendix D of the Draft SEIS indicates that existing macroinvertebrate, amphibian and fish communities are anticipated to re-populate with similar species as existed prior to the discharge of fill material, or would not be anticipated to be impacted by these discharges because they would likely move downstream out of the footprint of the fill or to adjacent, unimpacted areas. However, no additional analysis or documentation is provided to support these statements. Given the scope of potential impacts from a project of this nature and size both within the footprint of the fill and downstream, the impact analysis does not include the permanent impacts resulting from landscape changes resulting from implementation of the post-mining land uses (i.e., from currently forested headwater areas to transportation corridors, residential, and commercial development). The impact analysis also does not acknowledge the important interactions among aquatic organisms and with terrestrial organisms up the food chain and does not consider the existing body of science that documents the deleterious effects of Appalachian surface coal mining operations on the aquatic environment, as well as research documenting the absence of sensitive species in reconstructed stream channels following mining operations and downstream of valley fills. We recommend that the Corps' final CWA 404(b)(1) Guidelines analysis contain an appropriate level of analysis and/or documentation to support a factual determination of the potential impacts of proposed discharges on aquatic organisms and other wildlife, including the permanent impacts resulting from the proposed post-mining land uses.

Terrestrial

Forests

Although the Draft SEIS provides an accounting of the natural resources in the area, there is not an adequate description of either the condition of the forest resources in the project impact area or the potential impacts to forests and the functions that forests provide (especially the protection of water quality and quantity). For example, there are several well-documented forest types in the region (http://www.epa.gov/region03/mtntop/eis2003.htm). A more thorough accounting of the numerous forest types in the region (Braun 1942; Hinkle et al. 1993) should be included in the Draft SEIS. Omission of the mixed mesophytic forest type and its significance regionally and globally is conspicuous; as the Mid-Atlantic Highlands, which includes the project area, contains the most extensive interior hardwood forests in the world at the temperate latitudes (Riitters et al. 2000). These forests are also the most diverse in North America (Ricketts et al. 1999).

Additionally, data that we have describing the condition of forest resources reveals that the Delbarton to Belo alignment and the BMSM would impact valuable forest areas that provide important bird habitat, protect water quality and biodiversity, and support a wide array of ecosystem services at the landscape scale (Maps 1 and 2 in Enclosure 1a). Researchers have spatially analyzed and defined critical forest in the area as interior core forest areas of 250 acre or greater, headwater forests, and cove or ridge forests. These areas have been documented to be important for biodiversity and are more likely to be impacted by mining than other areas (Maxwell et al. 2012). Our analysis of critical forest in the three Hydrologic Unit (HUC) 12 sub-watersheds (Headwaters Pigeon Creek, Outlet Pigeon Creek, and Miller Creek-Tug Fork)

impacted by the project indicates that approximately 60% or more of the sub-watersheds currently contains critical forest (Table 1 in Enclosure 1a). With the addition of BMSM and all other permitted mines, the amount of critical forest declines approximately 10% in each HUC 12 sub-watershed. Furthermore, at the regional scale of the Tug Fork HUC 8 sub-basin, critical forest declines approximately 5% in future scenarios (Table 2 in Enclosure 1a).

The WV GIS Technical Center has recent (2011) forest fragmentation data that we recommend using to evaluate the project impacts to the terrestrial environment. We utilized the fragmentation data, recent land cover data, and WVDEP permit boundaries to assess how the landscape will change as mines are permitted using the forest fragmentation model after Vogt (2007). In general the forest becomes more fragmented with increases in forest edge and major decreases in large intact (i.e., core) areas of forest as BMSM and all permitted mines are added (Table 3, Maps 3-5 in Enclosure 1a). Under a worst-case scenario, and when summarized to HUC12 sub-watersheds, the potential exists that up to 30% of the unfragmented core forest areas would be lost. This pattern is also evident at the Tug Fork HUC 8 sub-basin scale (Table 4 in Enclosure 1a). Loss of connected interior forest areas has important implications for ecological processes (Wickham et al. 2007) and we recommend further examining this issue.

Species

Although the Draft SEIS documents species within the project area, it fails to account for the impacts of the project on those species. This is important to understanding the potential impacts not to just individual species, but to the biodiversity of the area as a whole.

The Draft SEIS only mentions two (wood thrush and ovenbird) of the twelve songbirds sensitive to fragmentation reported in the mountaintop mining inter-agency Programmatic Environmental Impact Statement (http://www.epa.gov/region03/mtntop/eis2005.htm). There was no mention of cerulean warbler. Cerulean warbler is identified as a Species of Concern under the Endangered Species Act and listed at Action Level II (in need of immediate management or policy range wide) by Partners in Flight (PIF) (http://www.epa.gov/region03/mtntop/eis2003.htm). Two other songbirds, Louisiana waterthrush, and eastern wood-peewee, studied in the Programmatic EIS, are listed as at Action Level III (management needed to reverse population decline or stabilize populations) (http://www.epa.gov/region03/mtntop/eis2003.htm). The potential impacts on forest songbirds was not addressed (section 4.3.1.2), and the omission of cerulean warbler is conspicuous.

According to the Programmatic EIS there are nine species that are listed as threatened (T), Endangered (E) or Species of Concern (SOC) that occur in West Virginia counties associated with the Tug Fork Subbasin (8-digit Hydrologic Unit) (Table 5 in Enclosure 1a). However, the Draft SEIS only discusses two of these species (Indiana bat and Virginia big-eared bat). We recommend providing information on the Eastern small-footed bat whose status has changed from SOC to Under Review for Listing because of white-nose syndrome.

In addition, we recommend that the revised EIS consider data collected by NatureServe and its member State Natural Heritage Programs regarding species that are rare or declining. For example, NatureServe data shows that there are 18 species considered at least at moderate risk of

global extinction that occur in counties associated with the Tug Fork subbasin (Table 6 in Enclosure 1a). We recommend additional analysis and discussion of whether these species will be impacted by the proposed mine and highway.

To more fully understand the potential direct and cumulative impacts of the proposed projects, we recommend that the analysis better describe the terrestrial environment, and the potential impacts from the proposed projects to the landscape features and the services they provide, which is currently lacking. See Wickham et al. 2013 for additional considerations.

Cumulative Impacts

The cumulative effects analysis presented in the Draft SEIS is primarily the Corps' CEA tool results. We are concerned that the CEA tool design is limited to the consideration of one parameter, the WVSCI, and relies on a presumed correlation to WVSCI. We recommend clarifying how the data used were generated, the vintage of the data and whether it correctly characterizes the environmental condition.

The CEA tool as presented in the Draft SEIS is a multi-criteria analysis tool which normalizes criteria of different units and then combines these normalized criteria using value judgments. Neither the specifics of the normalization methodology nor the value judgments (tradeoffs in the decision making process) were made transparent in the Draft SEIS. As the CEA tool supports decision-making, the public would benefit from disclosure of the methods and value judgments.

We are concerned with the scope, methods, lack of integration, and unsubstantiated conclusions of cumulative impacts in the Draft SEIS. Throughout the cumulative effects section of the Draft SEIS, the geographic scope for the analysis varies from state, regional, and various watershed scales making it difficult to follow and understand the cumulative impacts of the project. The Draft SEIS does not state why the impacts are examined at different scales, nor does it indicate which scale is used to determine whether there are cumulative impacts and if they are acceptable or unacceptable. For example, sections 4.7.3, 4.7.3.3, and 4.7.3.6 appear to characterize the environment and potential impacts of the project at different geographic scales that are not always clearly articulated, nor are the results at the various scales pulled together to substantiate the claims of positive cumulative impacts.

Additionally, the methods for the analyses conducted, whether qualitatively or quantitatively, are not transparent. For example, section 4.7.3.3 references expert testimony that is not easily accessible and provides some details on the spatial analysis but does not provide complete information on the methods for determining past, present, and future mining or vintage and scale of data used. Similarly the approach in section 4.7.3.6 is not adequately described to understand and evaluate the project, other projects and their impacts.

The Draft SEIS attempts to assess cumulative effects with limited analysis. The Draft SEIS presents an accounting of activities within the watershed, i.e. total number of streams filled or acres of forested cleared. However, there was no discussion or interpretation of the loss of environmental resources and functions. To the extent analysis is provided, it consists primarily

of unsupported conclusive statements. For example, "Cumulative Effects on the Aquatic Ecosystem" of Appendix D of the Draft SEIS makes conclusions such as "it is anticipated the past and currently approved discharges of fill material are more than adequately mitigated, and the addition of the currently proposed discharges of fill material under the BMSM would not result in adverse cumulative effects to waters of the U.S." This conclusion is not supported by the analysis or evidence provided. For example, Section 4.7.3.6 states:

> "Community development and infrastructure projects would have mixed impacts to most resources. Considerable land in the area could see surface mining. There are 13 reasonably foreseeable future mining SMCRA permits within the Pigeon Creek watershed. The cumulative total of past, present, and future mining activity would encompass approximately 22,787 acres, or 25 percent of the watershed; approximately 36,461 acres of the Wolf Creek-Tug Fork watershed, or 28.7 percent; approximately 8,110 acres of the headwaters of Pigeon Creek, or 27.7 percent; and, approximately 6,828 acres of the Miller Creek-Tug Fork watershed, or 19 percent. The cumulative total of past, present, and future mining within the geographic scope of the cumulative effects analysis is 5,477 acres. This represents 714 acres past, 1,409 acres present, and 3,354 acres future. Mining disturbances at levels less than 25 percent have been linked to degradation of the aquatic ecosystem (Petty 2010)."

From this paragraph it appears that there are cumulative impacts according to the limited literature cited. Additional research shows that these percentages in the affected watersheds approach or surpass levels identified as having negative impacts to stream conditions. For example, regionally, Bernhardt et al. (2012) ascertained that biological impairment occurred when surface coal mines occupy more than 5% of the contributing watershed. Merriam et al. (2011) examined development impacts to water quality in the Pigeon Creek watershed of Tug Fork and determined biological impairment thresholds at 25% total mining and at parcel densities of 10 parcels/km^2. Furthermore, Merriam et al. (2011) found that when both stressors are present, in-stream conditions are worse and a change of in-stream conditions occurs at lower percentages of mining when residential development is present or increases. This finding of both stressors additively affecting stream condition is particularly important given the projected community development and mining in the project area.

Additionally, Lindberg et al. (2011) found strong linear correlations between the concentrations of mining related contaminants (conductivity and the concentrations of selenium, sulfate, magnesium, and other inorganic solutes) and the proportion of the contributing watershed in surface mines (conductivity: $R^2 = 0.93$, sulfate: $R^2 = 0.87$, selenium: $R^2 = 0.87$; $p < 0.0001$ in all cases) in the Mud River. Results from Lindberg et al. (2011) also show that there is a cumulative impact of multiple mines within a single catchment within the Upper Mud River and that reclaimed mines still contribute negatively to water quality.

Mitigation

The CMP proposes the off-site restoration of 4,944 linear feet of Hell Creek, enhancement of 4,098 linear feet of stream channel off-site; preservation of 5,281 linear feet of six unnamed tributaries within the subwatershed; construction of wastewater collection lines and

tap-ins for the residents of Hell Creek's watershed and a three-mile long force main to the Delbarton, WV wastewater treatment plant; establishment of 29,079 linear feet of stream on-site; and 16,345 linear feet of stream establishment off-site within the Pigeon Creek, Miller Creek, and Buffalo Creek watersheds.

The proposed mitigation plan, as detailed in the Draft SEIS and as presented in the applicant's 2010 CMP, is insufficient to offset the proposed aquatic impacts associated with the proposal. The plan uses inadequate baseline data used to calculate debits and credits, relies on stream creation for the mitigation, and a lacks meaningful performance standards. In addition, the proposed mitigation plan includes a number of uncertainties which make it difficult to truly evaluate.

As mentioned previously, the data used to assess the baseline conditions of the resources proposed to be impacted is deficient. To fully assess mitigation needs, reliable baseline data is required to fully characterize the resources to be impacted and to identify the functions those resources are providing both locally and to the watershed. However, we have significant concerns with the data used to describe the baseline conditions of the impacted resources. Mitigation needs cannot be reasonably assessed without using accurate baseline data, particularly when that data is used to calculate debits and credits, as it was in this case. The functional categorization as described in the CMP also relied on the flawed biological, water quality, and habitat data assessments. Therefore, the adequacy of the CMP to offset the impacts to very good quality aquatic resources comparable to reference conditions cannot be fully evaluated until complete and accurate baseline data is collected according to the appropriate protocols.

Conceptually, the plan is a watershed-based approach that would address issues in the Hell Creek sub-watershed via restoration, enhancement, establishment, and preservation, but the majority of the proposed mitigation relies on stream creation, which has not been scientifically supported or generally shown to replace the functions and values of the high gradient Appalachian headwater streams that will be impacted. These new stream channels are unlikely to offset the permanent and temporary losses of headwater streams within these watersheds. The 2008 Compensatory Mitigation Rule notes that streams are difficult to replace, and does not encourage stream establishment.

Off-site stream establishment channels will likely receive suspended sediments, metals, and high ion concentrations from the mined area and can be expected to have minimal function due to the water quality limitations identified. The projection that water quality will be "good" in these channels is based on out of date information on the adjacent Peg Fork Surface Mine. Based on sampling data provided, conductivity downstream of valley fills at the Peg Fork Surface Mine has increased 500 µS/cm above pre-mining conditions and is continuing to rise (Fulton 2013.) The steepness of these new channels may also result in erosion and sediment problems downstream. The on-site creation consists of the conversion of sediment ditches into low-gradient, uniform channels will provide few, if any, of the ecological functions of the streams they are replacing. Petty et al. (2010) compared perimeter channels on mine sites to reference channels, and found that the channels more closely resembled wetlands than the streams they were designed to replace. They found a distinct shift from sensitive, lotic taxa in reference channels to tolerant, lentic taxa in perimeter channels. The perimeter channels tended

to be vegetated with obligate wetland plants, creating differences in vegetation, canopy cover, and structural habitat quality. The Draft SEIS does not provide any supporting evidence that the proposed created stream channels on or off-site will successfully replace lost functions of headwater streams and the projected benefit of this portion of the mitigation is unsubstantiated in the Draft SEIS.

The CMP indicates that 5,281 linear feet of six unnamed tributaries within the Hell Creek subwatershed will be preserved by deed restriction along with a riparian buffer. While the narrative indicates that this is in-kind mitigation, the benefit provided by the proposed sites is not evident. All of the preservation reaches appear to be downstream of either impacted or established reaches. Recent research indicates that upstream watershed condition is a critical component in the success of stream restoration (Doyle and Shields 2012, Lorenz and Feld 2013). Due to the watershed and water quality impacts upstream, preservation would likely be more effective if it included the intact headwaters.

As part of the Mitigation and Stream Restoration Plan CONSOL is proposing water quality improvements to the Pigeon Creek watershed. Those measures include the installation of sewer line and a pump station in the Hell Creek subwatershed, a force main extension and funding for the Delbarton Wastewater Treatment Plant for additional capacity. The document provides little detail on this aspect of the mitigation plan and the EIS would benefit from including additional details on the placement of the 13,000 linear feet of sewer lines and pump station.

The proposed water quality component includes the construction of wastewater collection lines and tap-ins for the residents of Hell Creek's watershed and force main to the Delbarton, WV wastewater treatment plant. This work is projected to result in the treatment of approximately 1.25 million gallons of wastewater a year in the Hell Creek watershed and could result in of the treatment of approximately 5.76 million additional gallons of wastewater per year in Pigeon Creek. It is not clear whether residents will be required to connect to this sewer line, which may affect the success of the project. When sewer lines have been installed in other watersheds in southern WV, the projects have been met with some resistance from local residents who are reluctant to pay the maintenance fees. In addition, the success criteria is not well-defined; the CMP indicates that fecal coliform levels will be measured in the watershed and success will be determined by demonstrating an unspecified decrease in monthly average fecal coliform levels.

In addition to the sewer line project, restoration and enhancement are proposed in the Hell Creek watershed. Clearly, environmental uplift could be gained, but the benefit may be overstated, particularly in the calculations of mitigation credits. The specifics of the proposal are not clear enough for a determination of the overall benefit. The Preliminary Plans are conceptual and do not clearly indicate what changes are proposed. Given the existing development as well as the future mine, the proposed benefit from restoration and enhancement may be severely limited based on site constraints. Most of the restoration and enhancement reaches are close to roads and residential development, so buffers will be limited and activities will be subject to landowner and county approval. The riparian buffer associated with the restoration reaches appears to be a 10 foot sewer line easement, with an "associated riparian zone." It is not clear

what kind of riparian zone can be established considering that vegetation is usually maintained by mowing and/or spraying within sewer line easements. In addition, full restoration typically relies on restoration of a floodplain or floodprone area, but it appears that the floodprone area will continue to be restricted by the existing and/or future development. Overall, the benefit of the proposal cannot be determined until the constraints are carefully considered.

While the applicant attempted to calculate mitigation debits and credits, all methods relied on the flawed baseline data to determine the required mitigation compensation. Water quality projections were optimistic; the projection was that conductivity will only increase by 200 µS/cm, which is unsubstantiated. As noted, credits were also maximized based on largely conceptual plans.

The negotiations appear to be ongoing with landowners to ensure protection of the proposed mitigation reaches and buffers. While the CMP described permanent protection and riparian buffers for the various components of the mitigation through the use of deed restriction, it is unclear whether the proposed deed restrictions will ultimately be obtained from the private property owners. The extent of protection that will be offered by the deed restrictions is also unclear. Lack of landowner cooperation has the potential to be a significant issue. It should be clear that the proposed stream and buffer areas can be fully protected in order to obtain the proposed mitigation credit.

Biological success criteria are not sufficiently robust to demonstrate a biological lift has been achieved. The proposed 5% increase in benthic WVSCI scores and species richness and biomass scores for fish at the end of year 10 does not clearly demonstrate an improvement. Five percent is too low to show a gain, since it would be within the range of natural variability. For the fish success criteria, a five percent difference in species richness is less than most re-visit data collected at the same site. Further, since the applicant is not proposing a method that is adequate to measure fish biomass, it is not likely that a change can be detected. EPA offers to work with you to identify more appropriate biological success criteria.

We are also concerned that the biological success criteria will only be applicable if water quality parameters remain within recommended ranges for freshwater organisms. These restoration sites are downstream of the BMSM and we recommend that the applicant be responsible for maintaining water quality parameters required to support freshwater organisms. We do not believe that a decrease in water quality as a result of the mining operations is an appropriate reason for not maintaining WVSCI scores.

Water quality success criteria are lacking. The sewerline is proposed to address the high fecal coliform levels in Hell Creek. The CMP indicates the monthly average is 619 colonies per 100 mL; the state maximum is a 30-day geometric mean of 200 colonies per 100 mL. An unspecified "decrease" from baseline fecal coliform levels is projected. It is not clear how much of a decrease in fecal coliform levels is required for the project to be considered successful, but we recommend that they attain primary and secondary contact criteria. As the purpose of the mitigation plan is to improve the Hell Creek watershed, we recommend that improvements in water quality be appreciable and improvement in biotic communities be measurable.

EPA has identified several significant concerns in the CMP including: the impacted resources are not adequately assessed and therefore, inaccurate information was used to calculate the needed mitigation; the compensatory mitigation is not likely to replace the resources because using enhanced sediment ditches because the resulting aquatic physical, chemical, and biological quality of these "replacement" streams is likely to be highly degraded; the proposed plan includes a number of uncertainties which make it difficult to truly evaluate, and the performance standards are inadequate. Therefore, it is not clear that the CMP will sufficiently or successfully compensate for the proposed impacts to resource of very good quality.

Physical and Human Environment

Air Quality

This section contains comments relevant to the characterization of mountaintop mining operation emissions, assessment of air quality impacts, and assessment of mitigation measures.

Emissions characterization

Evidence suggests that air pollution emissions from mountaintop mining activities are significant and varied. These emissions include fugitive and non-fugitive emissions, construction-related and non-construction-related emissions, and temporary and longer-term emissions sources.[1] A large fraction of the emissions may result from diesel combustion sources such as haul trucks, drills, excavators, and other similar equipment. Both tailpipe and evaporative emissions from mobile sources may be significant. Significant emissions may also be produced by other mining activities such as: clearing and burning, blasting, excavating (coal and overburden), haul truck loading and dumping, bulldozing, fugitive emissions from mobile sources, and windblown dust (e.g., from bare ground and overburden piles).

Pollutants to consider from these sources include: coarse particles (PM_{10}), fine particles ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and a variety of toxic pollutants -- diesel particulate matter, benzene, formaldehyde, 1,3 butadiene, acetaldehyde, acrolein, ethyl benzene, toluene, hexane, propionaldehyde, and xylenes. Of these, $PM_{2.5}$, PM_{10}, NO_2 and diesel particulates are the pollutants most likely to be emitted in amounts that could adversely impact human health, including as a result of increased concentrations of pollutants for which National Ambient Air Quality Standards (NAAQS) have been established.

Assessment of air quality impacts

The Draft SEIS states without support that air quality impacts will be temporary and restricted to the immediate construction zone. NEPA requires analysis of reasonably foreseeable direct and indirect impacts.

Considering the types of activities that occur at a surface mine along with the large

[1] EPA defines "fugitive emissions" in the Clean Air Act as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" (see title 40 of the Code of Federal Regulations, sections 70.2 and 71.2).

amount of diesel fuel that would be consumed by equipment and trucks, additional impacts are likely in and around the immediate vicinity of the proposed mine. We therefore recommend a more comprehensive assessment of potential air quality impacts.

For example, diesel engine exhaust is a pollutant of significant potential health concern. In EPA's 2002 Diesel Health Assessment Document (Diesel HAD), exposure to diesel exhaust was classified as likely to be carcinogenic to humans by inhalation from environmental exposures, in accordance with the revised draft 1996/1999 EPA cancer guidelines. In June 2012 the World Health Organization's International Agency for Research on Cancer (IARC) evaluated the full range of cancer-related health effects data for diesel engine exhaust and concluded that diesel exhaust should be regarded as "carcinogenic to humans." This designation was an update from its 1988 evaluation that considered the evidence to be indicative of a "probable human carcinogen."

Noncancer health effects of acute and chronic exposure to diesel exhaust emissions are also of concern. The Diesel HAD notes "that acute exposure to [diesel exhaust] has been associated with irritation of the eye, nose, and throat, respiratory symptoms (cough and phlegm), and neurophysiological symptoms such as headache, lightheadedness, nausea, vomiting, and numbness or tingling of the extremities."

Furthermore, there is an extensive body of human data showing a wide spectrum of adverse health effects associated with exposure to ambient particulate matter, of which diesel exhaust is an important component. These adverse health effects include cardiovascular effects and premature mortality.

Assessment of mitigation measures including diesel controls

EPA also recommends a more comprehensive assessment of reasonable measures for mitigating potential air quality impacts, including measures to limit non-fugitive emissions as well as fugitive emissions. For example, a number of approaches for reducing diesel engine emissions are readily available, including use of engines meeting the most recent emission standards, retrofit of engines from earlier model years, and limiting idling from diesel engines when not in use. A 90-percent reduction in exhaust emissions from mining equipment can be achieved through the use of new equipment, in lieu of older equipment, due to the final Tier 4 nonroad diesel emissions standards. These standards were fully phased in beginning in the 2011 model year for PM and will be fully phased-in beginning in the 2014 model year for NOx (http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm). Clean diesel projects can provide immediate reductions from existing diesel engines by retrofitting engines with pollution control devices, rebuilding and replacing older, dirtier engines, and/or switching to cleaner fuels. Fleets can also save fuel and lower emissions through the installation and use of idling reduction devices, and/or by implementing idling limits and other fuel-efficient operational practices.

EPA would be happy to work with the Corps and FHWA in facilitating the use of appropriate tools that may help assess potential air quality impacts.

Hydrology

Under the Surface Mining Control and Reclamation Act (SMCRA), the applicant conducted a Surface Water Runoff Assessment (SWROA). While the SWROA is not included as an appendix to the Draft SEIS it is referenced in several sections of the document of the Draft SEIS as stating that surface runoff would not increase due to infiltration through more permeable backfill and fill material and that there likely will be no increase in peak flow for the 25-year/24 hour storm event. (See, e.g., Section 4.3.3.2). These statements, however, are inconsistent with typical highway construction practices. To provide a stabilized structure for highway construction the subsoil materials are compacted, which would reduce soil permeability and increase surface runoff. Soil compaction could have an effect on peak surface water runoff for both the mining and post mining conditions. As there have been anecdotal reports of flooding on the Red Jacket section of the KCH, we recommend investigating if flooding potential would be increased by the construction of the highway.

Socioeconomic Impacts and Environmental Justice

The Draft SEIS, Section 4.2 Socioeconomic Environment and Section 4.2.5 Social Environment, does not adequately address the social and economic impacts. We are particularly concerned with the potential impacts to human health, especially to environmental justice communities and children within the vicinity of the proposed project.

Potential health effects can be compounded when the communities impacted are comprised of environmental justice communities (low income or minority populations) and children. The Draft SEIS did not fully consider disproportionately high and adverse effects on the impacted community, many of whom are low-income. The Draft SEIS concludes that the only negative impact of the project within the context of environmental justice is displacement of residents. EPA agrees that displacement of residents is a significant adverse impact; however, we recommend that a number of other potentially adverse impacts (air quality, truck traffic, drinking water, noise, proximity of blasting zones, cultural resources, community involvement, and cumulative effects) be analyzed and addressed with regards to their potential to disproportionately impact the low-income populations identified in the Draft SEIS.

An area of importance that was not addressed in the Draft SEIS is that of children's health. The Draft SEIS states, page 4-7, that 28.0 percent of the population is under the age of eighteen. Children by their stature and development are more at risk to environmental impacts than adults, and the need to specifically address these issues is recognized in Executive Order 13045 – "Protection of Children from Environmental Health Risks and Safety Risks." We recommend that the revised EIS specifically address potential impact to children's heath.

The Draft SEIS does not address impacts to cemeteries that are not eligible for listing on the National Register of Historic Places. Regardless, these cemeteries are of significance to descendants, and we recommend that the descendents be consulted with to ensure respect for their customs and beliefs, as well as ensuring that access to these cemeteries is maintained.

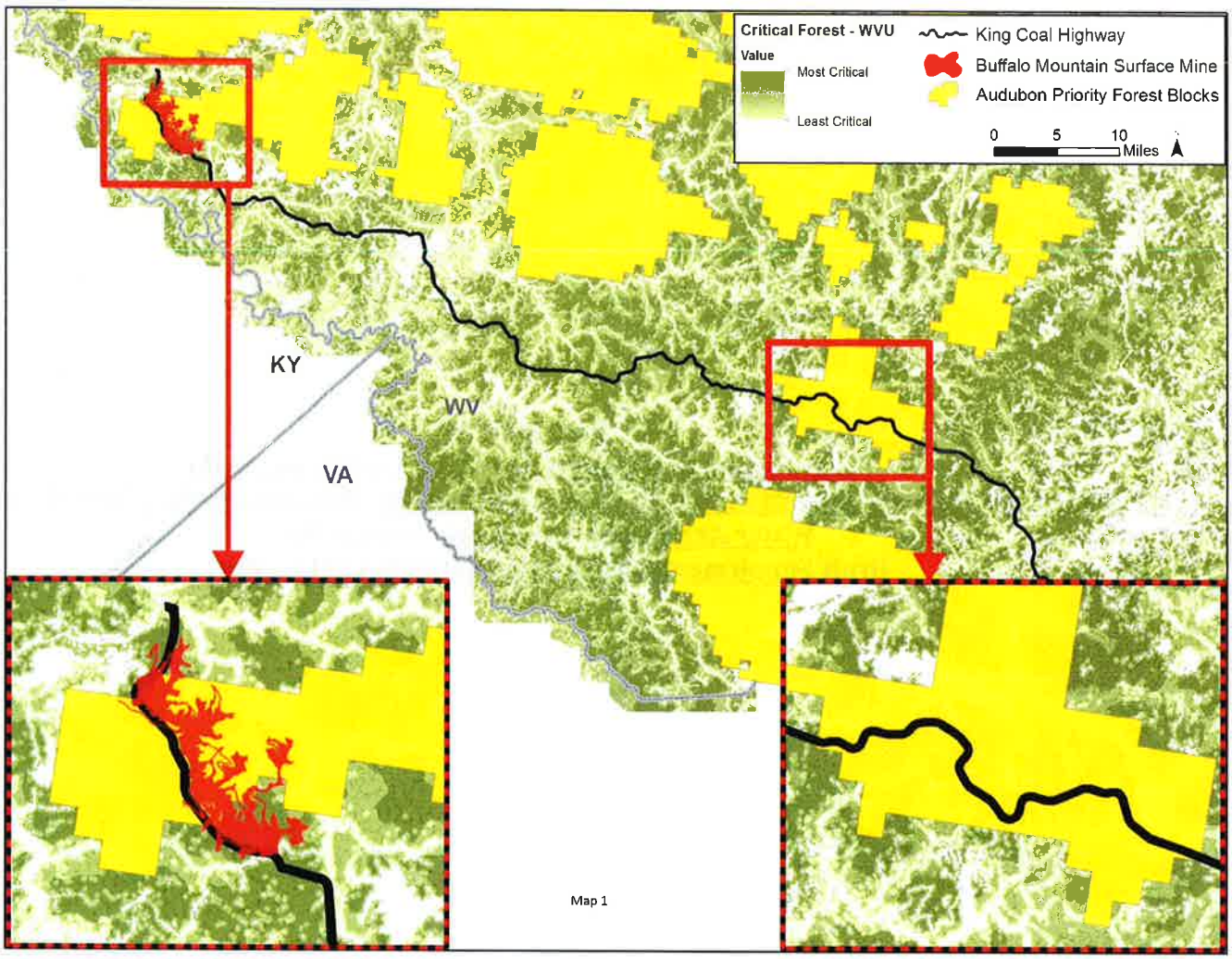
Drinking Water and Proposed Water Treatment

The proposed project is in the vicinity of public water supply systems, some small or very small. Systems in areas impacted by mining may require treatment to address contaminants that are in the water supplying the system. Historically, some public water supply systems in Mingo County near mining activity have required treatment to remove iron or manganese to address consumer concerns. Increased treatment costs can be a challenge for a small public water supply system that services small populations. We recommend that the analysis include a detailed discussion of the creeks supplying water to the public water supply systems and potential impacts to the public water supply systems in the project area particularly the Mingo County PSD – Naugatuck and the Williamson Utility Board as well as Mingo County PSD Chattaroy, Mingo County PSD Ragland District, Town of Delbarton, Mingo County PSD Pigeon Creek and Mingo County PSD Lick Creek.

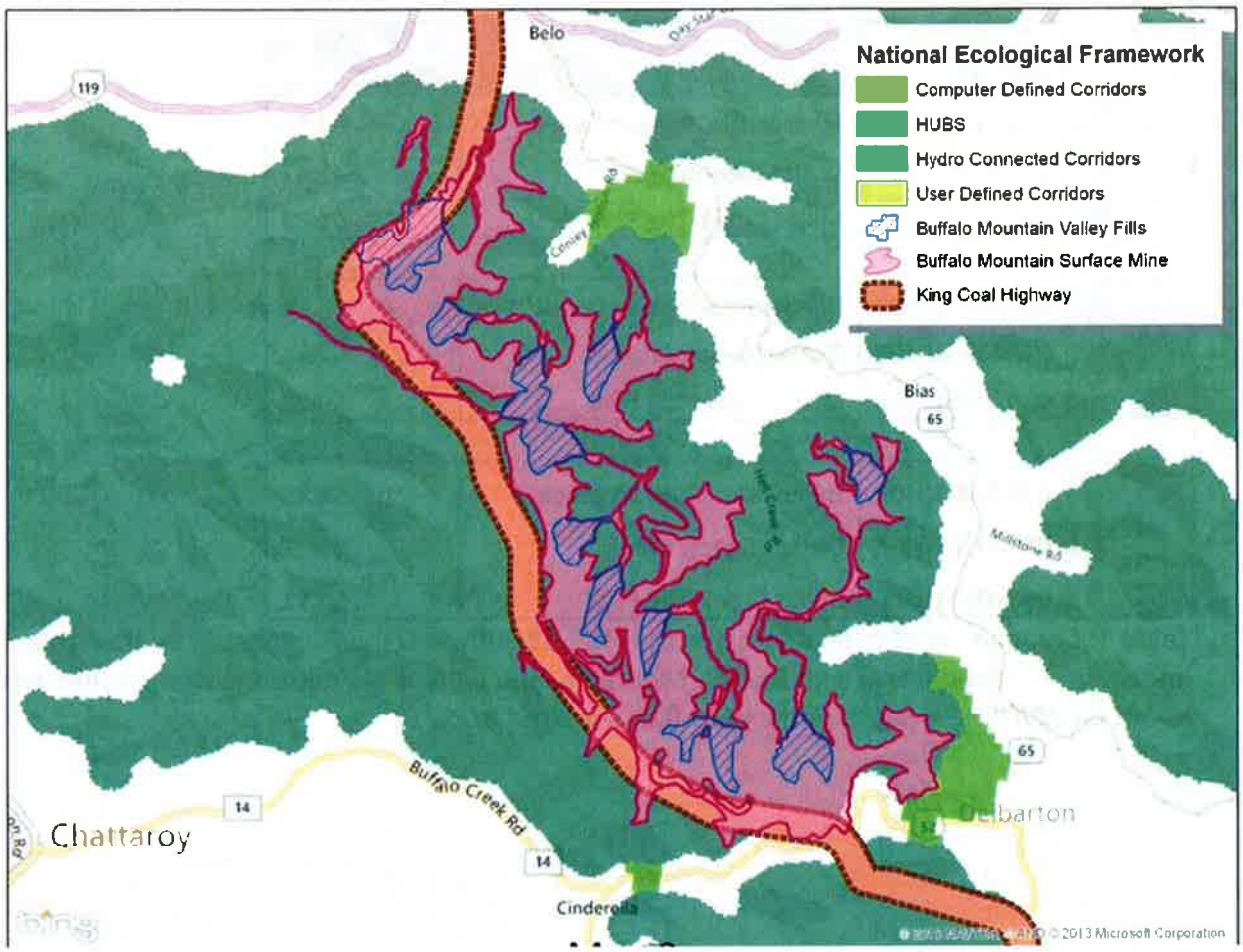
Depending upon the amount of pollution generated by mining, how toxins are handled or transported, the depth of aquifer de-watering, etc., mining activity can potentially impact domestic water supplies. In 2004, the Delbarton Mining Company needed to replace water for many residents of Mingo County, West Virginia due to mining activities (*Charleston Gazette* 2004). Although the project proposal states that impacts to ground water are not expected, per Section 4.2.7, we recommend an analysis to discuss how any negative impacts to existing domestic water supplies due to land use activity in the project area will be addressed.

Enclosure 1a

Maps, Tables and Figures for EPA's Comments on the King Coal Highway Delbarton to Belo Project and Buffalo Mountain Surface Mine Clean Water Act Section 404 Permit Application Draft Supplemental Environmental Impact Statement



Map 1. Audubon Priority Forest Blocks and WVU Critical Forests



Map 2. National Ecological Framework is a GIS based model of the ecologically important areas and connectivity of these natural landscapes developed by EPA Region 4.

	HUC_12	HU_12_NAME	% CRITICAL FOREST
CURRENT	050702010401	Headwaters Pigeon Creek	67.67
	050702010403	Outlet Pigeon Creek	71.87
	050702010506	Miller Creek-Tug Fork	61.18
BUFFALO	050702010401	Headwaters Pigeon Creek	66.78
	050702010403	Outlet Pigeon Creek	67.31
	050702010506	Miller Creek-Tug Fork	59.78
ALL MINES	050702010401	Headwaters Pigeon Creek	58.85
	050702010403	Outlet Pigeon Creek	61.17
	050702010506	Miller Creek-Tug Fork	54.11

Table 1: Comparison of critical forest in the HUC 12 Subwatersheds impacted by the project under current conditions, with Buffalo Mountain, and with all permitted mines. Mining data based on WVDEP Permit Boundary GIS files accessed 8/29/12.

	HUC_8	HUC_8_NAME	% CRITICAL FOREST
CURRENT	05070201	Tug Subbasin	69.33
BUFFALO MTN	05070201	Tug Subbasin	68.97
ALL MINES	05070201	Tug Subbasin	64.99

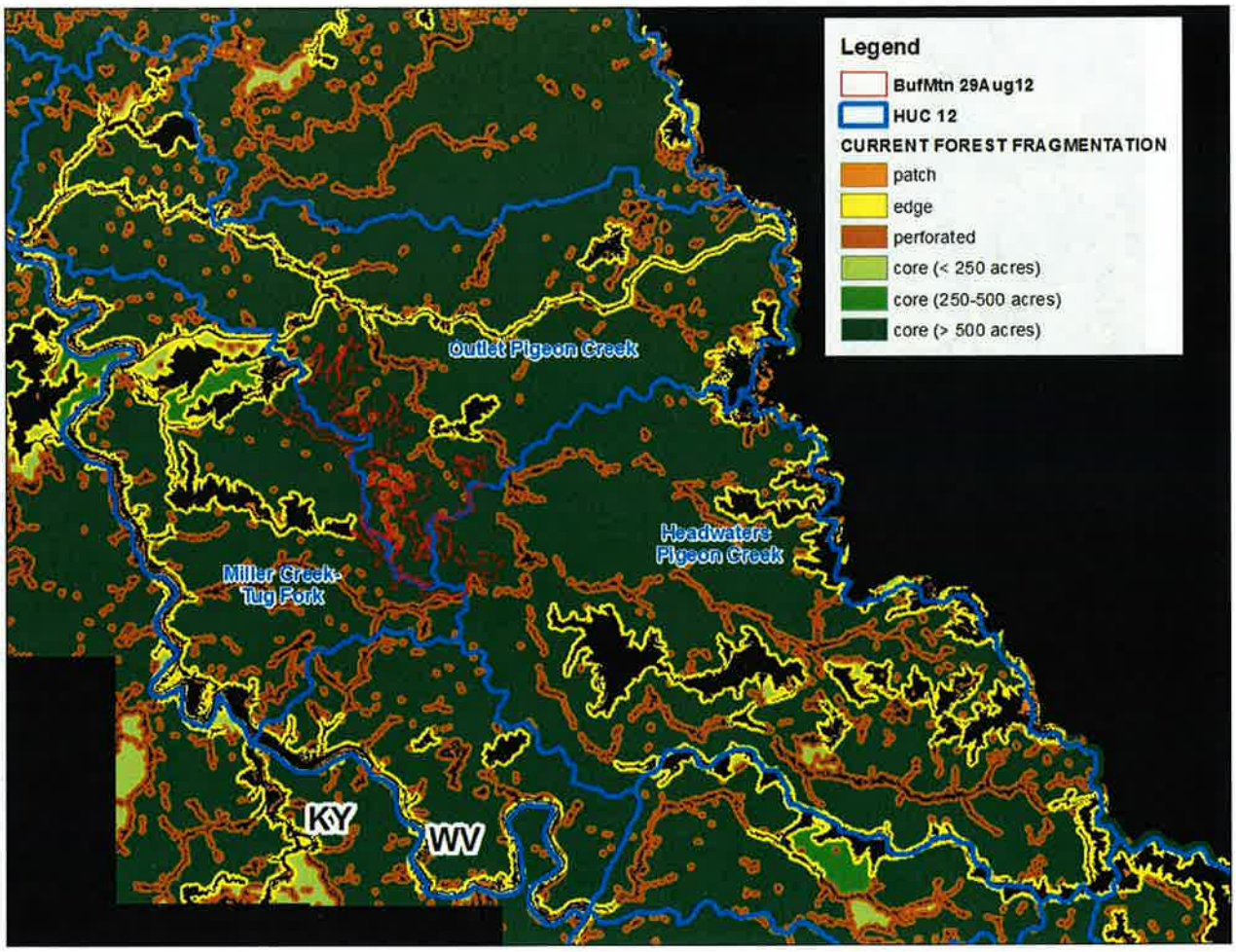
Table 2: Comparison of critical forest in the Tug HUC 8 Subbasin impacted by the project under current conditions, with Buffalo Mountain, and with all permitted mines. Mining data based on WVDEP Permit Boundary GIS files accessed 8/29/12.

	HUC_12	HUC_12_NAME	% PATCH	% EDGE	% PERFORATED	% CORE < 250AC	% CORE 250-500	% CORE > 500AC
CURRENT	050702010401	Headwaters Pigeon Creek	0.38	10.22	14.82	0.31	0.00	60.38
	050702010403	Outlet Pigeon Creek	0.29	8.56	12.13	0.12	0.00	71.83
	050702010506	Miller Creek-Tug Fork	1.29	13.77	12.02	0.62	1.23	56.79
BUFFALO	050702010401	Headwaters Pigeon Creek	0.60	12.01	18.46	1.62	7.57	43.25
	050702010403	Outlet Pigeon Creek	0.71	13.36	15.87	1.07	1.41	54.85
	050702010506	Miller Creek-Tug Fork	1.57	16.88	18.42	3.21	0.42	43.40
ALL MINES	050702010401	Headwaters Pigeon Creek	0.83	19.12	12.28	5.49	4.62	31.03
	050702010403	Outlet Pigeon Creek	1.49	17.58	13.08	2.89	2.18	40.82
	050702010506	Miller Creek-Tug Fork	2.36	23.15	15.01	4.67	0.00	31.30

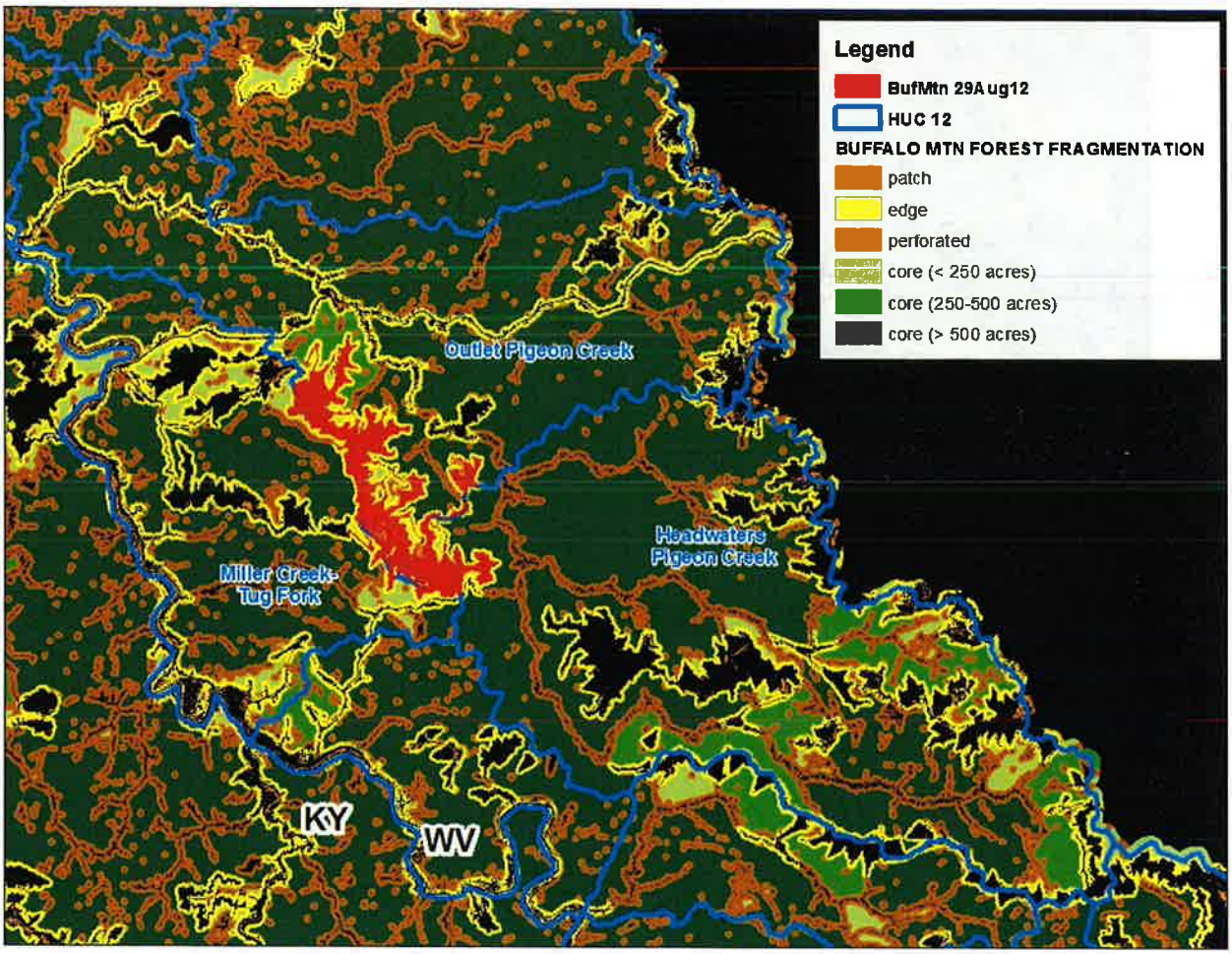
Table 3: Comparison of critical forest in the HUC 12 Subwatersheds impacted by the project under current conditions, with Buffalo Mountain, and with all permitted mines. Mining data based on WVDEP Permit Boundary GIS files accessed 8/29/12.

	HUC_8	HUC_8_NAME	% PATCH	% EDGE	% PERFORATED	% CORE < 250AC	% CORE 250-500	% CORE > 500AC
CURRENT	05070201	Tug Subbasin	0.00*	5.44	15.97	0.33	0.34	70.84
BUFFALO MTN	05070201	Tug Subbasin	0.47	6.52	24.27	1.43	1.08	58.21
ALL MINES	05070201	Tug Subbasin	0.87	12.17	21.10	3.12	1.16	47.55

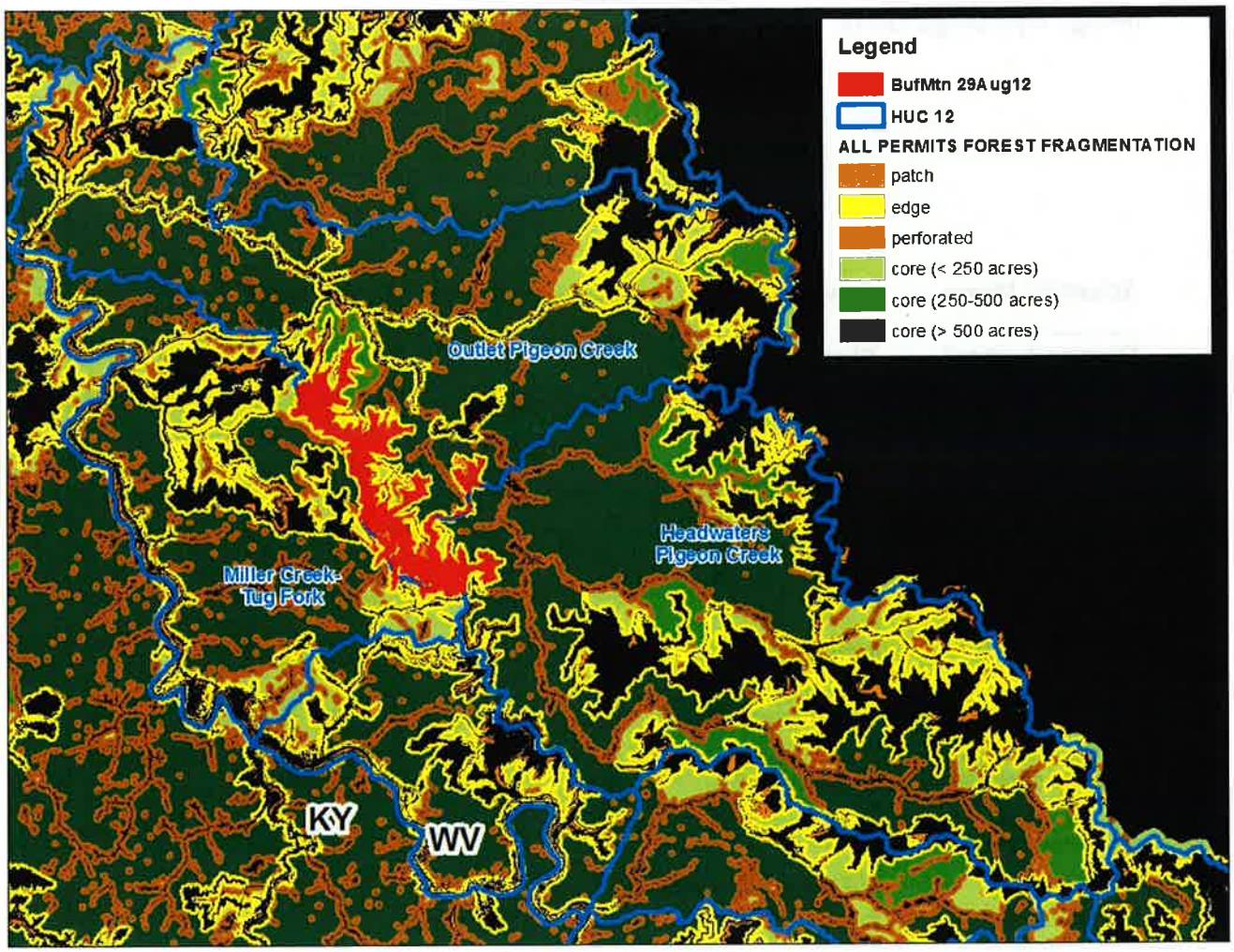
Table 4: Comparison of forest in the HUC 8 Subbasin impacted by the project under current conditions, with Buffalo Mountain, and with all permitted mines. Mining data based on WVDEP Permit Boundary GIS files accessed 8/29/12. (*Value is not zero but such a small number that when formatted it shows up in the table as zero. Most likely a result of the methodology of original data – see http://wvgis.wvu.edu/data/dataset.php?ID=451)



Map 3. Current (2011) forest core areas, edges and perforations.



Map 4. Potential future forest condition with Buffalo Mountain Mine as proposed.



Map 5. Potential future forest condition based on all permitted mines.

Table 5. Federally Listed Species occurring in counties associated with the Tug Fork Subbasin (8-digit Hydrologic Unit).

Scientific Name	Species	Status	Group	WV			KY			VA	
				Mingo	McDowell	Wayne	Lawrence	Martin	Pike	Buchanan	Tazwell
Percina burtoni	Blotchside darter	SOC	Fish								X
Cottus sp. 1	Bluestone sculpin	SOC	Fish								X
Cottus sp. 4	Clinch sculpin	SOC	Fish								X
Etheostoma osburni	Candy darter	SOC	Fish								
Cryptobranchus alleganiensis	hellbender	SOC	Amphibian	X	X						
neotoma floridana	eastern woodrat	SOC	Mammal	X	X						
Myotis sodalis	Indiana bat	E	Mammal	X	X					X	X
Corynorhinus townsendii virginianus	Virginia big-eared bat	E	Mammal								X
Myotis leibii	Eastern small-footed bat	U	Mammal								X
Corynorhinus rafinesquii	SE big-eared bat	SOC	Mammal	X	X						
Setophaga cerulea	Cerulean warbler	SOC	Bird	X	X						
Cambarus veteranus	Crayfish	SOC	Invertebrate	X	X	X					
Speyeria diana	Diana fritillary butterfly	SOC	Invertebrate	X	X					X	X
Juglans cinera	Butternut	SOC	Plant	X	X						
Saxifraga caroliniana	Gray's saxifrage	SOC	Plant	X	X						

Paxistima canbyi	Canby's mountain-lover	SOC	Plant								X
Monarda fistulosa ssp. brevis	Smoke hole bergomot	SOC	Plant								
Spirea virginiana	Virginian spirea	T	Plant							X	X
Cyprogenia stegaria	Fanshell mussel	E	Invertebrate				X				
Speyeria idalia	Regal fritillary	SOC	Plant							X	
Saxifraga careyana	Carey saxifrage	SOC	Plant							X	
Paravitrea mira	Funnel suprcoil	SOC	Invertebrate							X	
Isoperla major	Beartown perlodid stonefly	SOC	Invertebrate								X
Pseudanophthalmus hotulanus	Burkes Garden cave beetle	SOC	Invertebrate								X
Pseudanophthalmus vicarius	Cave beetle	SOC	Invertebrate								X
Litocampa sp. 5	Cave dipluran	SOC	Invertebrate								X
Stylodrilus beattiei	Cave lumbriculid worm	SOC	Invertebrate								X
Kleptochthonius regulus	Cave psuedo-scorpion	SOC	Invertebrate								X
Nesticus tennesseensis	Cave spider	SOC	Invertebrate								X
Arrhopalite commorus	Cave springtail	SOC	Invertebrate								X
Sphalloplana chandleri	Chandler's planarian	SOC	Invertebrate								X
Villosa trabalis	Cumberland bean pearly mussel	E	Invertebrate								X
Fusconaia cuneolus	Fine-rayed pigtoe	E	Invertebrate								X

Ptychobranchus subtentum	Fluted kidneyshell	C	Invertebrate								X
Pseudanophthalmus virginicus	Maiden Spring cave beetle	SOC	Invertebrate								X
Buotus carolinus	Millipede	SOC	Invertebrate								X
Dixioria fowleri	Millipede	SOC	Invertebrate								X
Pseudotremia alecto	Millipede	SOC	Invertebrate								X
Pseudotremia armesi	Millipede	SOC	Invertebrate								X
Pseudotremia tuberculata	Millipede	SOC	Invertebrate								X
Epioblasma capsaeformis	Oyster mussel	E	Invertebrate								X
Speyeria idalia	Regal fritillary	SOC	Invertebrate								X
Cumberlandia monodonta	Spectacle case	SOC	Invertebrate								X
Io fluvalis	Spiny riversnail	SOC	Invertebrate								X
Epioblasma florentina walkeri	Tan riffleshell	E	Invertebrate								X
Pleurobema oviforme	Tennessee clubshell	SOC	Invertebrate								X
Lasmigona holstonia	Tennessee heelsplitter	SOC	Invertebrate								X
Fusconaia barnesiana	Tennessee pigtoe	SOC	Invertebrate								X
Cimicifuga rubifolia	Appalachian bugbane	SOC	Plant								X
Poa paludigema	Bog bluegrass	SOC	Plant								X
Euphorbia purpurea	Glade spurge	SOC	Plant								X

Ilex collina	**Long stalked holly**	**SOC**	**Plant**								**X**
Buckleya distichophylla	**Piratebush**	**SOC**	**Plant**								**X**
Carex schweinitzii	**Schweinitz's sedge**	**SOC**	**Plant**								**X**

Table 6. Species occurring within the Upper Tug Subbasin that are rated as Globally Vulnerable or Imperiled by Nature Serve and associated conservation status within West Virginia. Species without a state status are not found within West Virginia. Nature Serve rankings of these species include S3 = Vulnerable, "At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors", S2 = Imperiled, "At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors", and S1 = Critically Imperiled, At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

Scientific Name	Common Name	Major Taxonomic Group	Nature Serve	
			Rounded Global Status	WV State Status
Peucaea aestivalis	Backman's Sparrow	Birds	G3: Vulnerable	SH
Ammocrypta clara	Western Sand Darter	Fishes	G3: Vulnerable	
Noturus stigmosus	Northern Madtom	Fishes	G3: Vulnerable	S1
Anemone quinquefolia var. minima	Dwarf Anemone	Flowering Plants	T3: Vulnerable	S2
Gentiana austromontana	Appalachian Gentian	Flowering Plants	G3: Vulnerable	S1
Liatris turgida	Turgid Gayfeather	Flowering Plants	G3: Vulnerable	S2
Prosartes maculata	Nodding Mandarin	Flowering Plants	G3: Vulnerable	S1
Saxifraga careyana	Carey's Saxifrage	Flowering Plants	G3: Vulnerable	S3
Saxifraga caroliniana	Carolina Saxifrage	Flowering Plants	G3: Vulnerable	S1
Cicindela ancocisconensis	Appalachian Tiger Beetle	Insects	G3: Vulnerable	S3
Speyeria Diana	Diana Friillary	Insects	G3: Vulnerable	S2/S3

Corynorhinus rafinesquii	**Rafinesque's Big-eared Bat**	**Mammals**	**G3: Vulnerable**	**S1**
Myotis leibii	**Eastern Small-footed Myotis**	**Mammals**	**G2: Imperiled**	**S1**
Neotoma magister	**Allegeny Woodrat**	**Mammals**	**G3: Vulnerable**	**S3**
Fusconaia subrotunda	**Longsolid**	**Mollusks**	**G3: Vulnerable**	**S2**
Lasmigona holstonia	**Tennessee Heelsplitter**	**Mollusks**	**G3: Vulnerable**	
Pleurobema oviforme	**Tennessee Clubshell**	**Mollusks**	**G2: Imperiled**	
Pleuronaia gibberum	**Tennessee Pigtoe**	**Mollusks**	**G2: Imperiled**	

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Enclosure 1b
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